

Developing MyDigCompTVET: A Digital Teaching Competency Framework for TVET Educators in Malaysia Informed By Literature Synthesis and Expert Interviews

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DOI: <https://doi.org/10.47772/IJRISS.2026.100800940>

Received: 09 September 2026; Accepted: 14 September 2026; Published: 21 September 2026

ABSTRACT

The digital transformation of technical and vocational education and training (TVET) requires educators to integrate digital technologies with vocational pedagogy, practical training, occupational standards and evolving industry requirements. Although established digital competency frameworks provide useful foundations, they do not fully address the distinctive requirements of workshop-, laboratory- and work-based TVET learning. This study aimed to develop MyDigCompTVET, a contextually grounded digital teaching competency framework for TVET educators in Malaysia. The study reports the qualitative exploratory phase of a broader exploratory sequential mixed-methods study. A critical literature synthesis covering Malaysian TVET policy, Education 4.0 and Education 5.0, digital TVET pedagogy, TPACK, Connectivism and international digital competency frameworks was used to inform the interview protocol and interpretation of the findings. The semi-structured interview protocol underwent expert review and pilot testing before individual interviews were conducted with 12 purposively selected experts from Malaysian technical universities, public training institutions and the technology industry. The interviews were transcribed verbatim, verified through member checking and analysed using a six-stage thematic analysis. Trustworthiness was strengthened through triangulation, peer cross-checking and an audit trail. The analysis generated 260 initial codes, which were consolidated into 20 candidate competency elements and organized into five domains: Digital Knowledge; Digital Skills; Professional Development and Lifelong Learning; Digital Ethics and Readiness; and Technology Integration in TVET. MyDigCompTVET extends general digital competency frameworks by incorporating vocationally specific requirements that involve practical instruction, industry technologies, authentic digital assessment, infrastructure readiness, data literacy, artificial intelligence, and digital safety. The framework provides a qualitative foundation for subsequent expert consensus and empirical validation phases.

Keywords: MyDigCompTVET; digital teaching competency; TVET educators; framework development; literature synthesis; expert interviews; thematic analysis; digital transformation ; Malaysia

INTRODUCTION

Digital transformation is changing the knowledge, skills and occupational practices required across contemporary industries. Technologies such as artificial intelligence, automation, the Internet of Things, simulation, learning analytics, augmented reality and virtual reality are increasingly embedded in industrial processes and professional workplaces. These developments require technical and vocational education and training (TVET) institutions to prepare graduates not only to operate current technologies but also to adapt to continuously changing occupational environments. UNESCO (2022) accordingly positions digital transformation as an important component of TVET reform and emphasises the role of TVET in supporting transitions towards more digital, inclusive and sustainable economies.

The implications of digital transformation for TVET extend beyond the acquisition of new equipment or the introduction of learning management systems. Digital technology must be meaningfully integrated into curriculum design, instructional delivery, practical training, assessment, and industry-based learning. Unlike many general educational settings, TVET teaching frequently takes place in workshops, laboratories, simulated workplaces and other practical environments where students are expected to demonstrate observable occupational competencies. Digital teaching in these contexts may involve virtual simulations, digitally supported demonstrations, remote laboratories, learning analytics, electronic portfolios and technology-mediated competency assessment. The effectiveness of these applications depends substantially on educators' ability to connect technology with vocational pedagogy, practical learning outcomes, occupational standards and safety requirements.

Digital teaching competency, therefore, involves more than general digital literacy or the operational ability to use technological tools. It encompasses the knowledge, skills, professional dispositions and contextual judgement required to select, adapt and evaluate digital technologies for educational purposes. A digitally competent TVET educator must be able to design technology-supported practical activities, develop relevant digital content, facilitate online and blended learning, conduct authentic digital assessments, interpret learner performance data, communicate and collaborate through digital platforms, protect learners' information, and continuously update professional knowledge. The educator must also be prepared to evaluate emerging technologies critically rather than adopting them solely because they are new or widely promoted.

Several international frameworks provide important foundations for understanding educators' digital competence. The European Framework for the Digital Competence of Educators, or DigCompEdu, organises educator competence around professional engagement, digital resources, teaching and learning, assessment, learner empowerment and the facilitation of learners' digital competence (Redecker, 2017). The UNESCO ICT Competency Framework for Teachers connects the use of technology with curriculum, pedagogy, institutional organisation, and professional learning (UNESCO, 2018). The ISTE Standards for Educators describe educators as learners, leaders, citizens, collaborators, designers, facilitators and analysts. DigComp 2.2 complements these educator-focused frameworks by describing broader competencies in information and data literacy, communication, digital content creation, safety, and problem-solving (Vuorikari et al., 2022).

The Technological Pedagogical Content Knowledge framework provides an additional theoretical explanation of effective technology integration. TPACK proposes that meaningful digital teaching emerges through interactions among technological, pedagogical and content knowledge rather than from technological knowledge alone (Mishra & Koehler, 2006). Connectivism expands this perspective by conceptualising learning as the development and activation of networks involving people, information, digital resources and technological systems (Goldie, 2016). Together, these perspectives are relevant to TVET because educators must integrate specialised technical content with appropriate pedagogy while remaining connected to evolving industry knowledge, professional communities and digital learning resources.

Nevertheless, direct adoption of general digital competency frameworks may not adequately represent the complexity of TVET teaching. Most existing frameworks were developed for broad educational applications and provide limited operational detail on workshop- and laboratory-based instruction, psychomotor learning, competency-based assessment, industrial technologies, and cyber-physical safety. They may also insufficiently address the educator's responsibility to align digital teaching activities with occupational standards, industry

certification, work-based learning and the technological infrastructure available within TVET institutions. Consequently, an educator may demonstrate general competence in using digital platforms while remaining insufficiently prepared to integrate simulation, industrial software, intelligent equipment or digital assessment into authentic vocational learning.

This limitation is particularly relevant in Malaysian higher education. The Malaysian Technical University Network (MTUN), comprising Universiti Tun Hussein Onn Malaysia (UTHM), Universiti Teknikal Malaysia Melaka (UTeM), Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA) and Universiti Malaysia Perlis (UniMAP), plays a strategic role in preparing technical graduates for industry. The digital competency requirements of educators within these universities are shaped by practical instruction, industry engagement, technology-intensive programmes and national expectations for digitally capable graduates. However, the literature indicates that digital teaching practices may vary according to educators' experience, institutional support, infrastructure, access to professional development and exposure to industry technologies. A contextually appropriate framework is therefore needed to guide professional development, institutional planning and the subsequent assessment of digital teaching competency among Malaysian TVET educators.

Existing research also tends to examine digital competency through separate issues, such as online teaching, technology acceptance, digital content development, assessment or learning management system use. While these studies contribute useful evidence, isolated competencies do not fully explain how technological knowledge, practical skills, professional learning, ethical readiness and institutional conditions interact in TVET practice. Furthermore, frameworks developed without sufficient input from practitioners, academic leaders, digital learning specialists, policymakers, and industry representatives may overlook the practical constraints under which TVET educators work.

To address these limitations, this study developed the **TVET Digital Teaching Competency Framework**, identified as **MyDigCompTVET**. The framework was informed by a critical synthesis of relevant theoretical, policy and empirical literature and by semi-structured interviews with 12 experts representing Malaysian technical universities, public training and administrative institutions, and the technology industry. The literature synthesis informed the development of the interview protocol and provided a basis for interpreting the findings. The candidate competency elements were generated through thematic analysis of the verified expert interview transcripts.

This paper reports only the qualitative exploratory phase of a broader exploratory sequential mixed-methods study. It focuses on the development and pilot testing of the interview protocol, expert selection, qualitative data collection, thematic analysis and construction of the preliminary framework. The subsequent Fuzzy Delphi consensus process, instrument development, Rasch measurement and principal component analysis are outside the scope of this article. This boundary allows the paper to concentrate on how expert knowledge was translated into a contextually grounded framework without prematurely claiming statistical validation.

Accordingly, the study addressed the following research questions:

1. What domains constitute digital teaching competency among TVET educators in Malaysian higher education?
2. What competency elements are required within the identified domains?
3. How can the literature-informed and expert-derived findings be organised into a preliminary TVET digital teaching competency framework?

The study contributes to the literature in three ways. First, it translates general digital competency concepts into the specific context of vocational pedagogy, practical training and industry-linked education. Second, it provides qualitative evidence from experts with diverse academic, institutional, technological and industry experience. Third, it presents a transparent pathway from literature-informed interview development and expert evidence to the 260 initial codes, 20 candidate competency elements and five preliminary domains of

MyDigCompTVET. The resulting framework provides the conceptual and qualitative foundation for subsequent consensus and empirical-validation phases.

LITERATURE REVIEW

Digital Teaching Competence

Digital competence broadly concerns confident, critical, responsible and purposeful engagement with digital technologies for learning, work and participation in society (Ferrari, 2013). For educators, it also entails pedagogical judgement: technology must be transformed into meaningful learning experiences. Digital teaching competence, therefore, combines knowledge, practical capability, professional engagement, ethical awareness and adaptability. It is demonstrated when technologies are selected and applied to improve learner engagement, accessibility, feedback, assessment and achievement.

Existing Digital Competency Frameworks

Four global frameworks provided the principal competency benchmarks. DigCompEdu focuses on educators' pedagogical and professional digital practice (Redecker, 2017). DigComp 2.2 provides a broad foundation in information and data literacy, communication, content creation, safety and problem-solving (Vuorikari et al., 2022). UNESCO ICT-CFT links teaching and curriculum with institutional development and professional learning (UNESCO, 2018), while the ISTE Standards describe seven professional roles through which educators use technology to improve learning. These frameworks are valuable, but each requires contextual interpretation for vocational teaching.

Table 1: Relevance and Limitations of Existing Frameworks for TVET Educators

Framework	Primary focus	Contribution	TVET limitation
DigCompEdu	Educator digital competence	Professional engagement, resources, pedagogy, assessment and learner empowerment	Limited specification of workshop learning and occupational technology
DigComp 2.2	Citizen digital competence	Information and data literacy, communication, content creation, safety and problem-solving	Requires translation from general literacy to pedagogical and occupational practice
UNESCO ICT-CFT	Educators within policy and institutional systems	Links pedagogy, curriculum, organisation, policy and professional learning	Provides limited operational detail for industrial equipment, workshop risk and practical data
ISTE Standards for Educators	Professional roles and high-impact practice	Learner, leader, citizen, collaborator, designer, facilitator and analyst roles	Requires additional indicators for psychomotor performance, workshop evidence and cyber-physical safety

Theoretical Foundations

TPACK explains how technological, pedagogical and content knowledge interact in instructional decision-making (Mishra & Koehler, 2006). In TVET, content knowledge encompasses occupational processes, technical standards, equipment operation and workplace safety. Technology integration must therefore support the authentic development of technical and psychomotor competencies rather than merely digitizing conventional classroom practices.

Connectivism complements TPACK by conceptualizing learning as the formation and activation of networks among individuals, digital resources, professional communities, and technological systems (Goldie, 2016).

This perspective is relevant to TVET educators because occupational knowledge changes rapidly and is distributed across industries, certification bodies, professional communities and digital platforms. Together, TPACK and Connectivism provide complementary foundations for understanding digital teaching competency as both an instructional and continuously evolving professional capability.

The Distinctive Context of TVET Teaching

TVET differs from general academic education because learning outcomes are closely linked to occupational performance and workplace standards. Delivery commonly involves workshops, laboratories, technical equipment, competency demonstrations, authentic projects and work-based learning. Digital teaching must therefore connect pedagogical decisions with industry tools, technical processes and safety requirements. Vocational educators may need to demonstrate processes through video or simulation, monitor workshop performance, generate digital evidence for competency assessment and integrate physical and virtual equipment.

Research with vocational instructors has identified competencies in online class management, instructional media production, digital assessment, and learning resource management (Wannapiroon et al., 2022). A broader architecture is nevertheless needed to encompass emerging technologies, institutional readiness, occupational alignment and the practical characteristics of vocational instruction.

Digital Transformation and Emerging Competencies

Data literacy is becoming essential because learning systems and assessment platforms generate information that can guide instructional decisions. Artificial intelligence creates opportunities for adaptive learning, feedback, and content production, while raising concerns about reliability, academic integrity, transparency, and bias. Educators also require competence in privacy, cybersecurity, intellectual property, responsible communication, digital well-being and inclusive access. Emerging technologies should not be treated as isolated technical skills; their educational value depends on how they support occupational learning, pedagogical goals and authentic competency development.

These developments indicate that TVET educators require a combination of technological understanding, vocational pedagogical capability, data literacy, ethical judgement and industry responsiveness that extends beyond general digital literacy.

Research Gap

Existing frameworks provide valuable international benchmarks but do not fully operationalize the competencies required for technology-supported teaching in TVET workshops, laboratories and industry-linked learning environments. In particular, limited attention is given to industrial technologies, cyber-physical safety, technical data literacy, authentic digital assessment, infrastructure readiness and alignment with occupational standards. Moreover, relatively few frameworks have been developed from the combined perspectives of TVET academics, digital learning specialists, institutional leaders, public-sector trainers, and industry professionals in Malaysian technical higher education. These limitations establish the need for a contextually grounded framework developed through direct engagement with relevant experts.

METHODOLOGIES

Research Design

The broader investigation used an exploratory sequential mixed-methods design in which qualitative exploration preceded expert consensus and quantitative validation (Creswell & Creswell, 2022). This article is deliberately bound to the qualitative exploratory phase. It reports the critical literature synthesis that informed the inquiry, development, and pilot testing of the interview protocol; interviews with 12 experts; thematic analysis of the verified transcripts; and the construction of the first framework draft. Fuzzy Delphi consensus, questionnaire development, Rasch measurement and principal component analysis belong to later phases and

are not reported here. The unit of analysis was a meaningful interview statement describing the knowledge, skills, attitudes, practices or enabling conditions required by TVET educators in digitally transformed learning environments.

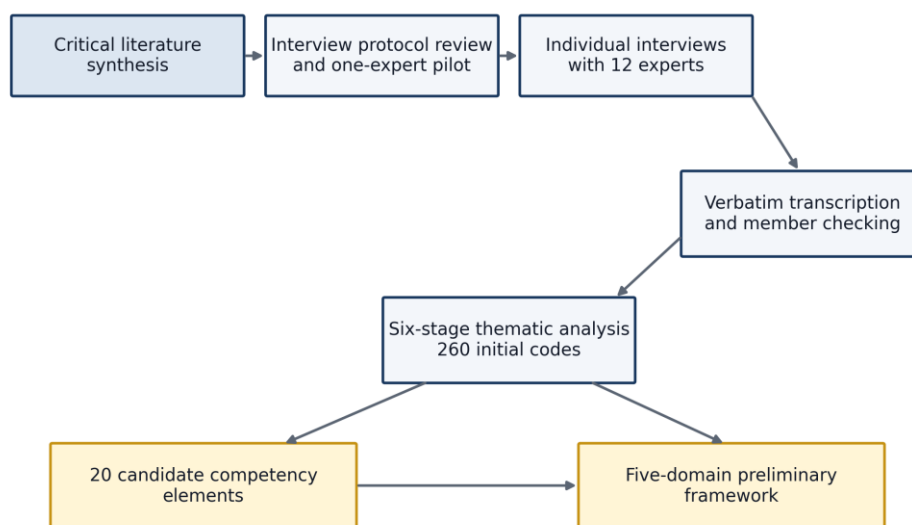


Figure 1. Evidence-based process for developing the TVET digital teaching competency framework.

Critical Literature Synthesis

The literature component was undertaken as a structured critical synthesis rather than a systematic literature review. Its purpose was conceptual development: to compare theoretical perspectives, international competency frameworks, TVET policy directions and empirical findings, and to interpret their implications for Malaysian technical universities. The synthesis was organised across six complementary streams drawn from the study's literature review: the Malaysian TVET system and policy environment; Education 4.0 and Education 5.0; digitalisation of TVET teaching and assessment; TPACK and Connectivism; global digital competency frameworks; and evidence from Malaysian, Southeast Asian and global contexts.

The literature was examined for recurring competency constructs, observable practices, contextual conditions, limitations of general frameworks and requirements unique to practical TVET delivery. Particular attention was given to workshop and laboratory learning, authentic assessment, learning analytics, artificial intelligence, simulation, augmented and virtual reality, the Internet of Things, digital safety, data governance, inclusion, professional learning and industry alignment. Concepts were compared across sources and translated into provisional TVET-oriented competency statements for comparison with the interview data.

Table 2: Scope and Analytical Contribution of the Critical Literature Synthesis

Literature stream	Analytical focus	Contribution to framework development
Malaysian TVET system and policy	MTUN, industry-driven TVET, quality assurance and national digital and skills agendas	Established the institutional, policy and occupational context.
Education 4.0 to Education 5.0	Digital, data-driven and human-centred educational transformation	Connected technological capability with ethics, well-being, sustainability and adaptability.

Table 2: Continue

Literature stream	Analytical focus	Contribution to framework development
Digitalisation of TVET pedagogy	Blended learning, LMS, authentic assessment, analytics, AI, simulation, AR, VR and IoT	Identified practices required for technology-supported workshop, laboratory and work-based learning.
TPACK and Connectivism	Technology-pedagogy-content integration, networked knowledge and communities of practice	Provided complementary lenses for instructional design and continuing professional learning.
Global competency frameworks	DigCompEdu, DigComp 2.2, UNESCO ICT-CFT and ISTE Standards for Educators	Provided international benchmarks and exposed gaps in vocational specificity.
Malaysia, Southeast Asia and global evidence	Local needs, institutional support, professional development, industry alignment and cross-context findings	Distinguished recurring competencies from context-dependent requirements and supported Malaysian adaptation.

Literature synthesis architecture

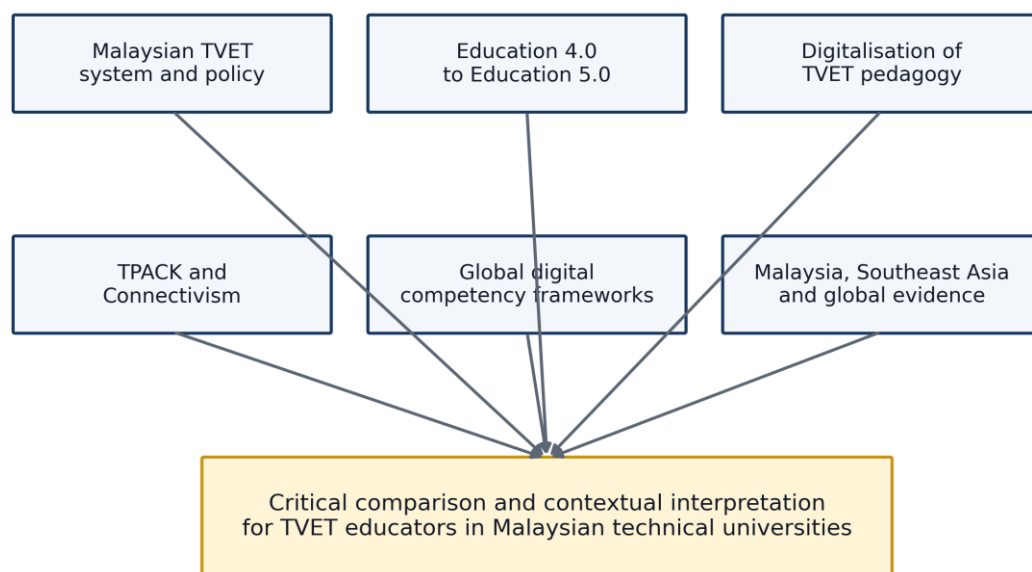


Figure 2: Architecture of the critical literature synthesis used for framework development.

Expert Selection and Data Collection

Purposive sampling was used to recruit 12 information-rich experts rather than a statistically representative sample. Eligibility requires deep knowledge of TVET or digital education, at least 5 years of professional experience in TVET, teacher education, or digital competency-related research, and direct or indirect involvement with a TVET institution, a technical university, or a relevant industry. Participants represented four Malaysian technical universities, public-sector training and administrative institutions, and industry. The sample size was justified through information power and the expectation that new information would diminish

within approximately 10 to 15 expert interviews (Malterud et al., 2016). Participants contributed in their individual professional capacity rather than as official representatives of their organisations.

The semi-structured protocol was developed from the literature and relevant documents and contained principal questions, core topics, keywords, and follow-up prompts, consistent with principles for systematic interview guide development (Kallio et al., 2016). A content expert reviewed its face and content validity, after which a pilot interview with one field expert assessed clarity, language and practical administration. The protocol was refined before the main interviews. Potential participants were contacted via official email and provided with the study information and written consent form. Individual interviews were scheduled according to participants' availability; most were conducted at their workplaces, and others were conducted via videoconference. Participants gave additional verbal permission before audio and video recording. Each interview was transcribed immediately and returned to the participant for correction, addition or deletion through member checking.

Table 3: Anonymised Professional Profile of the Expert Participants

Code	Sector	Area of Expertise	Experience	Professional Role
E1	Higher education – MTUN	TVET teaching, mechanical engineering technology and technology-supported practical instruction	15 years	Senior Lecturer, Department of Mechanical Engineering Technology, Faculty of Engineering Technology, UTHM
E2	Higher education – MTUN	Academic development, curriculum enhancement, teaching excellence and digital pedagogy	12 years	Head of Department, Centre for Academic Development and Excellence, UTHM
E3	Technology industry and professional certification	Industry digital competencies, workforce certification and technology-skills development	17 years	CompTIA Country Manager for Malaysia, Indonesia and Brunei
E4	Higher education – MTUN	Virtual-learning systems, learning-management infrastructure and educational technology support	22 years	Senior Information Technology Officer, Centre for Virtual Learning, UTHM
E5	Higher education – MTUN	Administrator competency development, professional training and organisational learning	12 years	Senior Assistant Registrar, Competency Development and Training Division, Centre for Leadership and Competency, UTHM
E6	Higher education – MTUN	Educational leadership, institutional policy, sustainable educational development and community engagement	18 years	Deputy Director for Leadership and Community, Centre for Sustainable Educational Leadership Development, UniMAP
E7	Higher education – MTUN	E-learning, digital-learning resources, technology-supported teaching and institutional digital-learning management	17 years	Director, Centre for Learning Resources and E-Learning, UMPSA

Table 3: Continue

Code	Sector	Area of Expertise	Experience	Professional Role
E8	Higher education – MTUN	Interactive media, multimedia learning, digital-content development and technology-enhanced pedagogy	22 years	Professor, Department of Interactive Media, Faculty of Information and Communication Technology, UTeM
E9	Higher education – MTUN	Computing education, information technology, academic leadership and digital transformation	20 years	Dean, Faculty of Computer Science and Information Technology, UTHM
E10	Higher education – MTUN	Interactive media, educational multimedia, digital pedagogy and technology-enhanced learning	21 years	Professor, Department of Interactive Media, Faculty of Information and Communication Technology, UTeM
E11	Government and public-sector training	Strategic digital training, public-sector digital competency and technology-based professional development	19 years	Training Consultant, Strategic Training Section, Digital Training Studies Division, Information Technology Studies and Technology Development Centre, INTAN
E12	National TVET instructor-training institution	TVET pedagogy, vocational-instructor development, teaching supervision and professional skills training	21 years	Vocational Training Officer, Teaching Enhancement and Supervision Unit, Skills Professional Development Programme Division, CIAST

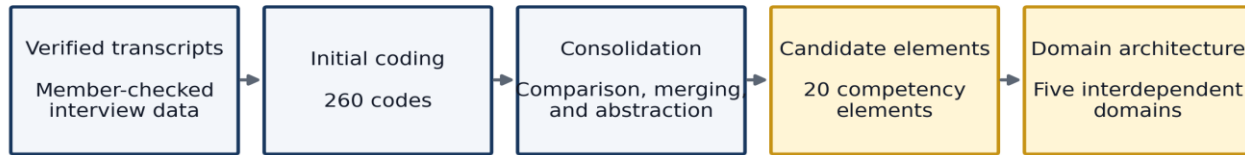
Thematic Analysis and Evidence Integration

The verified transcripts were analysed using Braun and Clarke’s (2022) six-stage thematic process: familiarisation with the data, generation of initial codes, searching for potential themes, reviewing themes, defining and naming themes, and writing the analysis. Transcription was verbatim and retained pauses, repetitions and relevant non-verbal utterances. Each transcript was organised in Microsoft Word using two columns, with the transcript in one column and coding notes and analytic comments in the other. Repeated reading supported familiarisation with both explicit content and contextual meaning.

All potentially relevant statements were coded without imposing a predetermined numerical limit. The resulting 260 initial codes were compared and clustered into categories and candidate themes. Theme review occurred in two rounds: first, the fit of codes within each proposed element was examined; second, relationships between elements and domains were evaluated. Irrelevant themes were removed and duplicate codes were merged. A knowledgeable research peer cross-checked the developing structure to reduce interpretive bias. Theme and element labels were then refined for clarity, consistency, and contextual relevance, while consulting DigCompEdu, UNESCO ICT-CFT, and the ISTE Standards to maintain international comparability.

The literature synthesis and interviews served complementary functions. Theory, international frameworks and empirical studies established the conceptual and comparative evidence base, while interviews contributed contextual and practice-oriented evidence. A candidate element was retained when it was consistently represented across relevant sources, repeatedly emphasised by experts, addressed a distinctive TVET requirement or reflected an emerging competency with substantial future relevance.

Illustrative audit trail



Evidence extract → initial code → consolidated category → candidate element → framework domain

Figure 3: Progression from raw evidence to the five-domain framework.

Trustworthiness and Ethical Considerations

Trustworthiness was addressed through credibility, transferability, dependability and confirmability (Nowell et al., 2017). Credibility was strengthened through participant review of transcripts, field notes, and initial interpretations; triangulation among literature, documents, and interview evidence; and peer cross-checking of themes. Transferability was supported by describing participant experience and institutional settings while preserving anonymity. Dependability and confirmability were reinforced through a structured coding system and an audit trail connecting original excerpts, codes, categories, elements and domains. Participants received written study information, gave informed consent and were reminded that participation was voluntary. The approving ethics committee and approval number should be inserted from the formal approval record before submission.

RESULTS

The integrated analysis produced 20 candidate competency elements organised within five overarching domains. **Table 4** illustrates how the two evidence sources supported the interpretation of selected elements, while **Table 5** presents the complete preliminary architecture.

Table 4: Illustrative Integration of Literature and Interview Evidence

Candidate element	Literature contribution	Expert contribution	TVET interpretation
Online teaching and learning	Digital pedagogy and online learning	Blended practical instruction	Integration of theory, demonstration and preparation for practical work
Digital assessment and feedback	Technology-supported assessment	Digital evidence of competency	Documentation and feedback for practical competency attainment
Data literacy	Data-informed educational practice	Interpretation of learner performance	Monitoring progress in technical and competency-based learning

Table 4: Continue

Candidate element	Literature contribution	Expert contribution	TVET interpretation
Artificial intelligence in education	Emerging AI-supported teaching	Potential for resource and feedback support	Responsible use of AI in vocational instruction
Digital infrastructure	Implementation and organisational conditions	Equipment, connectivity and support	Enabling laboratory, workshop and simulation-based learning

Table 5: Preliminary Domains and Candidate Elements

Domain	Candidate competency elements	Domain description
Digital Knowledge	Instructional technology; digital content development; artificial intelligence in education; data literacy; emerging and disruptive technology knowledge	Knowledge required to understand, evaluate and select digital technologies.
Digital Skills	Online teaching and learning; digital collaboration; digital assessment and feedback; professional digital communication; digital problem-solving, creativity and innovation	Practical capability to apply technologies in teaching, assessment and professional work.
Professional Development and Lifelong Learning	Continuous digital professional development; micro-credentials and modular learning	Continuing development in response to technological and occupational change.
Digital Ethics and Readiness	Digital safety, ethics and well-being; inclusive education and digital accessibility; digital culture and critical thinking; adaptation to emerging technologies	Responsible, inclusive, critical and adaptive engagement with digital technology.
Technology Integration in TVET	Digital curriculum integration; digital leadership, governance and management; digital infrastructure; industry-oriented digital application and entrepreneurship	Integration of technology with vocational curriculum, practical learning and industry requirements.

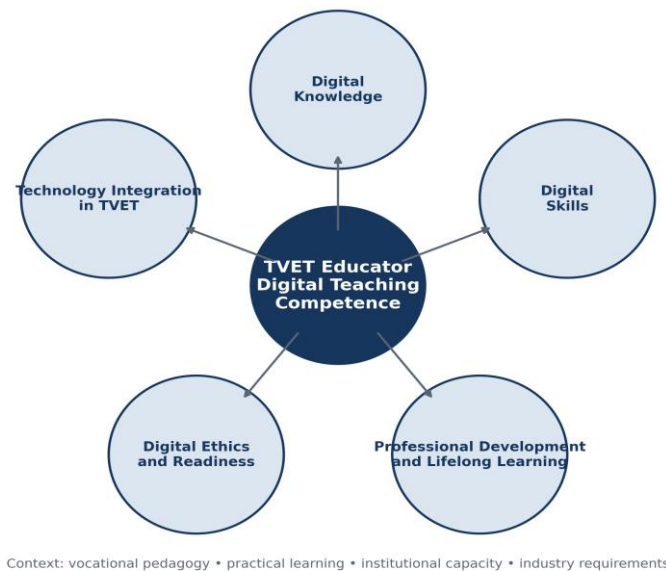


Figure 4: Preliminary TVET-specific digital teaching competency framework.

Digital Knowledge

Digital Knowledge represents the conceptual understanding that enables educators to evaluate and select technologies appropriately. It encompasses instructional technologies, digital content principles, data, artificial intelligence and disruptive technologies. Expert evidence framed this knowledge as dynamic: educators must understand not only current systems but also how emerging technologies may alter occupational processes, curriculum and pedagogy.

Digital Skills

Digital Skills refers to the practical ability to use digital technologies in teaching, assessment, communication, collaboration and problem-solving. In TVET, this includes blended practical instruction, digital demonstrations, learner interaction, feedback and evidence of competency achievement. Creativity and problem-solving become essential when general-purpose technologies must be adapted to specialised vocational tasks.

Professional Development and Lifelong Learning

Rapid technological change means that competence cannot be maintained through one-time training. This domain represents educators' capacity to continuously update digital, pedagogical, and occupational knowledge. Practice-oriented development, modular learning, micro-credentials, professional communities and industry engagement provide possible mechanisms for sustaining competence.

Digital Ethics and Readiness

Digital Ethics and Readiness incorporates responsible technology use, safety, privacy, accessibility, critical judgement, well-being and willingness to adapt. Educators need confidence and openness, while institutions must provide access, guidance and support. Critical thinking is particularly important when evaluating digital information, automated outputs and AI-generated content.

Technology Integration in TVET

Technology Integration in TVET connects educators' competence with the curriculum, practical training, institutional infrastructure, and occupational requirements. It most clearly distinguishes the framework from general teacher models. Digital curriculum design should connect learning outcomes, practical activities,

industry standards and competency-based assessment. Leadership, governance and infrastructure matter because individual practices depend on policy, equipment, connectivity and technical support.

DISCUSSIONS

Moving Beyond General Digital Competence

The findings confirm that digital teaching competence is multidimensional, but they extend established models by treating vocational context as an organising consideration. DigCompEdu provides strong coverage of digital pedagogy, professional engagement and learner empowerment. The preliminary framework retains these foundations while giving greater prominence to practical competency assessment, occupational technologies, infrastructure, curriculum alignment and institutional readiness.

TPACK explains the interaction of technology, pedagogy and content, but in TVET, content knowledge remains closely connected to occupational performance. Technology integration must therefore be evaluated by its ability to improve learners' ability to perform authentic technical tasks safely and competently.

Contribution of the Expert Evidence

The expert interviews strengthened the contextual relevance of the literature-derived competencies. The critical synthesis established common constructs across theory, global frameworks and empirical research, while experts clarified how those capabilities operate in workshops, laboratories, competency-based programmes and industry-linked environments. Combining these sources reduced the risk that the framework would be either excessively generic or narrowly dependent on local opinion.

Significance of the Five-Domain Structure

The structure demonstrates that competence is not limited to observable technical skills. Effective practice depends on relationships among knowledge, application, professional learning, ethical readiness and institutional integration. The domains are interdependent rather than sequential. For example, the responsible application of artificial intelligence requires conceptual knowledge, practical use, ethical judgement, continuing learning and institutional support.

Implications for TVET Institutions

The framework may guide professional development planning, training needs analysis, modular learning, curriculum review, infrastructure planning, and future instrument development. It should not yet be used as a validated measurement instrument. The present study establishes a conceptual and qualitative foundation; expert consensus and psychometric evaluation remain separate subsequent phases.

Theoretical Contribution

The theoretical contribution lies in integrating pedagogical competence, technological capability, occupational relevance, professional development, and institutional conditions into a single TVET-specific architecture. The inclusion of leadership, governance and infrastructure recognises that educators' competence is enacted within a wider organisational system rather than in isolation.

Limitations

The expert sample was purposively selected and is not statistically representative of all Malaysian TVET stakeholders. Interpretation may reflect the researcher's judgment despite systematic coding and maintenance of an audit trail. Technological and occupational requirements also evolve rapidly, requiring periodic framework review. Finally, this phase did not evaluate expert consensus, item functioning, dimensionality or measurement validity.

CONCLUSION

This study developed the preliminary MyDigCompTVET framework through a critical synthesis of the literature and thematic analysis of interviews with 12 experts. The literature synthesis established the theoretical, policy, and contextual foundations of the inquiry and informed the interview protocol and the interpretation of the findings. The expert interviews generated 260 initial codes, which were progressively consolidated into 20 candidate competency elements and organized into five domains: Digital Knowledge; Digital Skills; Professional Development and Lifelong Learning; Digital Ethics and Readiness; and Technology Integration in TVET.

MyDigCompTVET extends general educator digital competency frameworks by explicitly addressing the practical, occupational, technological, ethical and institutional characteristics of TVET. Its distinctive features include attention to workshop- and laboratory-based teaching, authentic digital assessment, technical data literacy, industry technologies, digital safety and institutional readiness. The framework should nevertheless be regarded as a preliminary qualitative output rather than a validated measurement model. Subsequent research should examine expert consensus concerning the proposed domains and elements and evaluate the framework's measurement properties among Malaysian TVET educators.

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